

RUSSIAN RIVER BIOLOGICAL ASSESSMENT

Prepared for:

U.S. ARMY CORPS OF ENGINEERS

San Francisco District
San Francisco, California

and

SONOMA COUNTY WATER AGENCY

Santa Rosa, California

Prepared by:

ENTRIX, INC.

Walnut Creek, California

September 29, 2004

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LIST OF ACRONYMS AND ABBREVIATIONS

<i>Term</i>	<i>Definition</i>
A	
ADCP	Acoustic Doppler Current Profiles
ADFG	Alaska Department of Fish and Game
ADWF	average dry weather flow
AF	acre-feet
AFY	acre-feet per year
ARM Plan	Aggregate Resource Management Plan
ASR	aquifer storage and recovery
Avg FPP	average size (fish per pound) at release
AWG	Agency Working Group
B	
BA	Biological Assessment
BASMAA	Bay Area Stormwater Management Agencies Association
BKD	Bacterial Kidney Disease
BML	Bodega Marine Laboratory
BMPs	best management practice(s)
BO	Biological Opinion
BOD	biological oxygen demand
BRA	Benefit Risk Analysis
C	
CCC	Central California Coast
CCF	hundred cubic feet
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish and Game
CDHS	California Department of Health Services
CDOC	California Department of Conservation

<i>Term</i>	<i>Definition</i>
CDOF	California Department of Finance
CDWR	California Department of Water Resources
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cfs/hr	cubic feet per second per hour
cm	centimeter(s)
CMRPD	Camp Meeker Recreation and Parks District
cm/s	centimeters per second
CPP	Continuing Planning Process
CPUE	catch per unit effort
CRWQCB	California Regional Water Quality Control Board
CSR	coho salmon replacement rates
CTR	California Toxics Rule
CVDP	Coyote Valley Dam Project
CVFF	Coyote Valley Fish Facility
CWA	Clean Water Act
D	
D1610	SWRCB Decision 1610
DCFH	Don Clausen Fish Hatchery (also known as Warm Springs Fish Hatchery)
DEIS	Draft Environmental Impact Statement
DO	dissolved oxygen
E	
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
El.	elevation
EPA	U.S. Environmental Protection Agency

<i>Term</i>	<i>Definition</i>
ESA	Federal Endangered Species Act of 1973
Estuary	Russian River Estuary
ESU	Evolutionarily Significant Unit
EWSL	Emergency Water Supply Line
F	
FEIS	Final Environmental Impact Statement
FEP	Fisheries Enhancement Program
FERC	Federal Energy Regulatory Commission
FL	fork length
FMEP	Fisheries Management and Evaluation Plan
FMMP	Farmland Mapping & Monitoring Program
FPP	fish per pound
fps	feet per second
FR	Federal Register
ft/hr	feet per hour
ft ³	cubic feet
G	
GIS	Geographical Information System
gpd	gallons per day
gpm	gallons per minute
H	
HGMP	Hatchery and Genetic Management Plan
hp	horsepower
hr	hour(s)
HSA	Hydrologic Service Area
I	
IPM	Integrated Pest Management
IPOTW	Ignacio Publicly Owned Treatment Works

<i>Term</i>	<i>Definition</i>
J	
K	
km	kilometer(s)
km/h	kilometer(s) per hour
KRIS	Klamath Resource Information System
KW	kilowatt(s)
L	
lb	pound
lf	linear feet
LMHPP	Lake Mendocino Hydroelectric Power Plant
M	
m ³ /s	cubic meter(s) per second
M&E Plan	Monitoring and Evaluation Plan
MCIWPC	Mendocino County Inland Water and Power Commission
MCRRFCD	Mendocino County Russian River Flood Control and Water Conservation Improvement District
MG	million gallons
mgd	million gallons per day
mg/l	milligram(s) per liter
mi ²	square miles
min	minute(s)
ml	milliliter
mm	millimeter(s)
MMWD	Marin Municipal Water District
MOU	Memorandum of Understanding
MSC	Merritt Smith Consulting
MSL	mean sea level
MTBE	methyl tertiary-butyl ether
Mt DNA	Mitochondrial DNA

<i>Term</i>	<i>Definition</i>
MW	megawatt(s)
N	
NaOH	sodium hydroxide
NATURES	Natural Rearing Enhancement System
NBWA	North Bay Watershed Association
NCPA	Northern California Power Authority
NCRWQCB	North Coast Regional Water Quality Control Board
NCWAP	North Coast Watershed Assessment Program
NEPA	National Environmental Policy Act
NFP	Natural Flow Proposal
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service, now known as NOAA Fisheries
NMWD	North Marin Water District
NOAA	National Oceanic and Atmospheric Administration
NOAA	National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPOTW	Novato Publicly Owned Treatment Works
NPS	nonpoint source (discharge)
NTU	Nephelometric turbidity unit
O	
OCSD	Occidental County Sanitation District
ODFW	Oregon Department of Fish and Wildlife
O&M manual	operation and maintenance manual
P	
PG&E	Pacific Gas and Electric Company
PIT	Passive Integrated Transponder
PL	Public Law
PMG	Prince Memorial Greenway
PPFC	Public Policy Facilitating Committee

<i>Term</i>	<i>Definition</i>
ppm	parts per million
ppt	parts per thousand
PVID	Potter Valley Irrigation District
PVP	Potter Valley Project
Q	
QPF	Quantitative Precipitation Forecast
R	
RFP	Request for proposal
Rkm	river kilometer
RM	river mile
RMA	Resource Management Associates
RRCWD	Russian River County Water District
RREITF	Russian River Estuary Interagency Task Force
RRSM	Russian River System Model
RRWQM	Russian River Water Quality Model
S	
SAR	smolt-to-adult return
SCWA	Sonoma County Water Agency
SD	Sanitary District
SFBRWQCB	San Francisco Bay Regional Water Quality Control Board
SL	standard length
SPCC	Spill Prevention, Containment, and Control plans
sq mi	square mile
SRSWRS	Santa Rosa Subregional Wastewater Reclamation System
SVCSD	Sonoma Calley County Sanitation District
SVOC	Semi-volatile organic compounds
SWMP	Storm Water Management Program
SWRCB	State Water Resources Control Board

<i>Term</i>	<i>Definition</i>
T	
TDS	Total dissolved solids
THPs	Timber Harvest Plans
TKN	Total Kjeldahl Nitrogen
TMDL	Total Maximum Daily Load
TRT	Technical Recovery Team
TSS	total suspended solids
U	
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USSCS	U.S. Department of Agriculture Soil Conservation Service (now known as Natural Resources Conservation Service)
V	
VESCO	Vineyard Erosion and Sedimentation Control Ordinance
VOC	volatile organic compounds
VOMWD	Valley of the Moon Water District
W	
WDFW	Washington Department of Fish and Wildlife
WDR	Waste Discharge Requirements
WEP	Water Education Program
WLA	Waste Load Allocation
WQM	Water Quality Monitoring
WSDP	Warm Springs Dam Project
WSE	water surface elevation
WSTSP	Water Supply and Transmission System Project
WWTP	Wastewater Treatment Plant

<i>Term</i>	<i>Definition</i>
	X
	Y
YOY	young of the year
	Z

The U.S. Army Corps of Engineers (USACE), the Sonoma County Water Agency (SCWA), and the Mendocino County Russian River Flood Control and Water Conservation Improvement District (MCRRFCID) are undertaking a Section 7 Consultation under the federal Endangered Species Act (ESA) with the National Oceanic and Atmospheric Administration (NOAA Fisheries) to evaluate the potential effects of their proposed operation and maintenance activities in the Russian River on listed salmonid species and their habitat.

This document, the Biological Assessment (BA), provides a description of environmental baseline including historical project operations and maintenance procedures. It presents proposed structural changes to project facilities and proposed changes to project operations and maintenance procedures. The BA evaluates the effects of the proposed project including ongoing project operations and proposed changes to project facilities, operations and maintenance procedures on threatened stocks of coho salmon, steelhead, and Chinook salmon. Section 1 presents the scope of the BA and describes the institutional agreements and constraints related to the project facilities and operations. Section 2 describes environmental baseline conditions in the watershed from a regional perspective and summarizes the status of the listed salmonid species in the Russian River. Section 3 describes baseline operations of project facilities and identifies the effects of these operations on salmonids. Section 4 presents a detailed description of the proposed project under consideration and the conservation actions that would be taken to improve habitat conditions for listed salmonids. The proposed project has seven different activities: 1) flood control operations, 2) hydroelectric operations, 3) water supply and transmission operations, 4) flow and estuary management, 5) channel maintenance for flood control and water supply needs, 6) restoration and conservation activities, and 7) operation of the fish production facilities.

The next three sections of the BA examine the direct and indirect impacts of the project on coho salmon, steelhead, and Chinook salmon. Section 5 gives an analysis of the effects of the proposed activities on the different lifestages of each listed fish species, and compares these effects to baseline conditions. Section 6 considers all project activities in concert to characterize their collective effect on each fish species. This section examines all project activities in an integrated manner to determine whether the proposed project would improve habitat conditions for listed salmonids over baseline, and decrease the chance of population extinction. Finally, the effects of interrelated/interdependent activities and effects of future nonfederal actions (cumulative effects) are evaluated in Section 7. Five activities were identified as *interrelated or interdependent* to the proposed project: 1) water transmission to the service areas of SCWA's contractors and customers, 2) non-native fish stocking in project reservoirs, 3) recreational fishing activities for hatchery produced steelhead, 4) channel maintenance of Public Law (PL) 84-99 (nonfederal) sites in the Russian River and Dry Creek, and 5) operations of the City of Ukiah's Hydroelectric Project. Section 8 presents the references cited in the document and the information obtained from personal communications with other

individuals and internet web sites. Section 9 provides definitions of technical terms used in the document. Section 10 provides photos of the facilities and project features.

The Appendices include supplemental information to provide the reader with additional information on the results of the analysis, as well as other reports used in the preparation of the BA. Appendix A presents an evaluation of alternative actions that were considered, but not proposed, as part of the project description. Appendix B includes information on the methods used to determine the effects of project flows on the listed species and describes the permit terms that would be requested for the water rights held by SCWA. Appendix C presents the information on the evaluation criteria used in the effects analysis (Section 5). Appendix D, Preliminary Recreational Analysis for the Flow Proposal, and Appendix E, Economic Analysis for the Russian River BA, include supplemental studies conducted to assist in the development and evaluation of the alternative scenarios for managing instream flows in the Russian River and Dry Creek.

The BA will be submitted to NOAA Fisheries. NOAA Fisheries will then prepare a Biological Opinion (BO) for the proposed project. A proposed monitoring program and an implementation plan for the new facilities will be developed jointly with NOAA Fisheries. Implementation of some activities for the proposed project would require environmental review under the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) as well as other agreements, permits or certifications from other state and federal agencies.

CHANGES IN CURRENT OPERATIONS

The proposed project modifies current operations and maintenance practices in the Russian River. Some of the modifications are in progress or are being implemented on a trial basis, while others will require more analysis before they can be fully implemented. A few project operations will require the construction of new facilities. Some will require regulatory approvals or congressional authorizations before they can be implemented.

A major objective for the proposed changes to project facilities and operations is to improve aquatic habitat conditions or reduce the opportunity for injury or harm to listed salmonids. The major proposed changes to current project operations include:

- Make structural and operational modifications at Coyote Valley Dam.
 - Reduce effects to fish during annual inspection and maintenance operations by providing a minimum instream flow and reducing the ramping rate (the rate at which releases from the dam are decreased).
- Make structural and operational changes at Warm Springs Dam.
 - Repair and clean the uppermost tunnel at the control structure of the dam (recently completed) to provide better temperature control for releases.
 - Reduce ramping rates to avoid rapid changes that could strand young fish.
 - Improve the reliability and quantity of the water supply to the hatchery.

- Make structural and operational changes at the Mirabel and Wohler diversion facilities to reduce effects to young fish.
 - Improve fish screens at both diversions.
 - Improve fish passage at the inflatable dam.
 - Reduce the opportunity for entrapment in the infiltration ponds.
- Modify flow releases from Warm Springs Dam and Coyote Valley Dam (after the State Water Resources Control Board (SWRCB) modifies SCWA's water-right permits).
 - Lower instream flows during the summer in Russian River and in Dry Creek below those required under SWRCB Decision 1610 (D1610) to improve summer habitat for listed fish species.
 - Eliminate artificial breaching of the sandbar at the river mouth during the summer to improve summer rearing habitat.
 - Develop additional water supply measures to meet future demand while protecting fish habitat.
- Modify channel maintenance activities.
 - Focus bank stabilization in the Russian River to specific sites and modify protocols to benefit listed fish species.
 - Adaptively manage vegetation and/or sediment maintenance activities in flood control channels and natural waterways to improve habitat, where feasible.
- Revise fish production facility operations to implement:
 - An isolated harvest program for steelhead;
 - An integrated recovery program for coho salmon (beginning with the captive broodstock program);
 - No hatchery production for Chinook salmon; and
 - Future programs that could include an integrated harvest program for steelhead and an integrated recovery program for Chinook salmon, if warranted.

Additional descriptions of proposed changes to facilities and operations are provided below.

FLOOD CONTROL, WATER STORAGE, AND SUPPLY OPERATIONS

Coyote Valley Dam

Under the proposed project, Lake Mendocino would continue to be managed for flood control, water supply, and hydroelectric power generation.

Annual and periodic (5-year) pre-flood inspections and maintenance activities would continue to be performed at Coyote Valley Dam. Reductions in releases from the dam are required to conduct inspections or repairs. Under the proposed project, ramping rates at flows less than 250 cfs would be reduced from 50 cfs per hour (cfs/h) to 25 cfs/h to reduce the risk of stranding fish in the Upper Russian River mainstem. The outlet structure at the dam would also be modified to allow greater control of flows during the ramping-down process.

To avoid dewatering the East Fork Russian River, USACE would install pumps to supply a bypass flow of 25 cubic feet per second (cfs) during inspection and maintenance activities. Dam inspections would also be scheduled later in the season (between July 15 and October 15) so that salmonid fry, which are more susceptible to stranding than larger juveniles, have time to grow. Finally, a 15-cfs release from the bypass pipeline would be used to ensure adequate flows to the Coyote Valley Fish Facility (CVFF), which is located at the base of the dam.

Warm Springs Dam

Lake Sonoma would continue to be operated for flood control, water supply, and hydroelectric power generation. As with Coyote Valley Dam, maintenance and inspection activities are conducted at Warm Springs Dam to ensure proper operations. To avoid dewatering rearing habitat in Upper Dry Creek, flows from the dam would be ramped down at a rate of 25 cfs/h or less during inspections and a minimum bypass flow of 25 cfs would be provided to Dry Creek.

Modifications would be made to the water supply line to the Don Clausen Fish Hatchery (DCFH) to provide a more reliable hatchery water supply. This would improve conditions at the hatchery and help in the implementation of a proposed broodstock program for coho salmon (see below).

Transmission System

SCWA would continue to divert and deliver water to water contractors through their water transmission system. This system consists of diversion facilities, treatment facilities, pipelines, water storage tanks, booster pump stations, and groundwater wells. SCWA would continue to operate and construct the transmission system facilities, as authorized under the Eleventh Amended Agreement for Water Supply (SCWA 2001a), to meet current and future water supply demands.

The inflatable dam at the Mirabel diversion facility would continue to be operated to increase infiltration to the aquifer beneath the river streambed. SCWA plans to create a single depression in the crest of the inflatable dam during the smolt outmigration period to improve fish passage.

Fish screens at the Mirabel diversion facility would be reconfigured to comply with NOAA Fisheries and California Department of Fish and Game (CDFG) fish screen criteria. This will help reduce the risk of impingement of juvenile fish during rearing and

downstream migration. If needed, the fish ladder and the bypass pipeline on the east side of the dam would also be modified to improve fish passage.

At the two Wohler infiltration pond diversions, new intake structures and new fish screens would be installed to protect young fish when the diversions are in operation. The fish screens would be removed when the Mirabel inflatable dam is lowered. Fish entrained during winter storms could return to the river. The infiltration ponds would be graded to promote drainage back to the river and reduce the risk of stranding fish. Fish rescues would continue to be conducted if needed.

FLOW MANAGEMENT

Analyses conducted to date indicate that habitat for listed fish species could be improved by decreasing summer flows (ENTRIX, Inc. 2003b). Under the proposed water management (Flow Proposal), releases from Warm Springs and Coyote Valley dams would be modified to improve rearing and migration conditions for salmonids in the Russian River, Dry Creek, and the Estuary. The Flow Proposal would also provide sufficient water to satisfy existing water demand in the Russian River and Dry Creek, and meet future demands on the SCWA system as defined by the Water Supply and Transmission System Project (WSTSP). To implement the Flow Proposal, D1610 would need to be modified by a new order from SWRCB.

The most substantial changes under the Flow Proposal would be a reduction in downstream flow from Coyote Valley Dam and Warm Springs Dam between June and October. For example, under the current D1610 management scenario, summer flows in the Russian River near Ukiah are typically about 230 cfs. The Flow Proposal would provide summer median monthly flows that would typically range from 140 to 185 cfs. Median monthly flows in Dry Creek would decrease by 32 to 34 percent under the Flow Proposal relative to D1610 under *all* water supply conditions and by 40 to 44 percent in *dry* water supply conditions. Overall, the Flow Proposal would increase the quality and quantity of summer rearing habitat for salmonids under current and future water demand levels in Dry Creek and the upper and middle mainstem Russian River.

The lower flows in the Russian River would allow flows downstream of the Mirabel inflatable dam to be managed so the quantity of water flow into the Russian River Estuary (Estuary) would be low enough to maintain the Estuary as a closed system. This action would avoid artificial breaching of the sandbar at the river mouth during summer. It would thus improve summer rearing habitat in the Estuary and would create better conditions for upstream migration of Chinook salmon. Artificial breaching may still be required to prevent flooding to private property and roads during storms, primarily in the fall.

The Flow Proposal would provide median monthly flows of 52 to 78 cfs from July through September in *normal* and *dry* years. In *critically dry* years, flows could drop to the minimum flow of 35 cfs. (See Table 4-5 and Table 5-35 for additional details on expected flow rates.)

The goal of the Flow Proposal is to maintain suitable rearing habitat for listed salmonids. Because the lower flow rates necessary for suitable rearing habitat would make it more difficult for SCWA to meet future supply demands of the water contractors, additional water-supply measures would be needed so that SCWA could continue to meet all of its contractors' demands for water. Some of the measures under consideration include an aquifer storage and recovery (ASR) program, additional diversion facilities, and new raw water pipeline. SCWA is reviewing the types and feasibility of these facilities to meet water supply needs.

CHANNEL MAINTENANCE

Channel maintenance activities would continue to be conducted in the Russian River and its tributaries to reduce the potential for flooding and bank erosion. Current activities include sediment removal and vegetation maintenance, channel debris clearing, and bank stabilization activities.

SCWA is assessing the capacity of flood control channels in the Russian River basin. Where flood capacity allows, sediment and vegetation maintenance practices would be modified to reduce potential adverse effects on fish while maintaining sufficient flood capacity. For example, in channels where it is determined that flood capacity can be maintained, some canopy cover would be allowed to develop on the upper banks. Moreover, young trees (thinned and pruned) would be allowed to colonize the lower banks to improve conditions for rearing and upstream migration.

SCWA and MCRRFCD bank stabilization activities in the mainstem Russian River would also be modified to reduce potential negative effects on listed fish species. Gravel-bar regrading and overflow channel creation would generally be limited to areas with potentially severe bank erosion. Bank stabilization projects would also be conducted when levees are weakened, or where a flooding threat to infrastructure or private property exists. If appropriate, bioengineered structures may be installed to stabilize banks that are found to consistently be at risk of eroding. The USACE would review and revise its channel maintenance requirements in its Operation and Maintenance (O&M) Manuals to provide greater protection for salmonids in the Russian River.

Vegetation maintenance may also occur where there is encroachment of exotic pest plants such as *Arundo donax* (giant reed).

HABITAT RESTORATION

SCWA plans to continue its proactive role in habitat restoration and enhancement projects, and in promoting measures that contribute to the health of the ecosystem and the watershed. These efforts include support for state and federal recovery plans, watershed management, riparian and aquatic habitat protection, instream restoration projects, improvements to fish passage, and water conservation and recycling. To maximize the effectiveness of dollars invested, SCWA plans to assist in developing project priorities on a basin-wide level, in cooperation with CDFG, other public agencies, and private interests in the watershed. SCWA would also continue its public information and

education programs to increase awareness of the importance of protecting and restoring habitat for listed species.

SCWA provides potable water to eight cities in Sonoma County (water contractors) through its water supply and transmission system. SCWA is in the process of implementing a water-recycling program to reduce the amount of water taken from the Russian River during the peak water demand season. The recycling program would redistribute tertiary-treated wastewater from the water contractors for the irrigation of agricultural crops. This would potentially help restore suitable flow conditions for salmon in tributaries to the Russian River and improve the reliability of the water supply for agricultural purposes in Sonoma County.

FISH PRODUCTION FACILITY OPERATIONS

The DCFH and CVFF were developed to mitigate for lost habitat upstream of Warm Springs Dam and Coyote Valley Dam, respectively. Fish production goals for DCFH were established to compensate for loss of coho salmon and steelhead production in Dry Creek (mitigation goals) and to enhance harvest opportunities for coho salmon and Chinook salmon in the Russian River. Fish production goals for CVFF were established to compensate for the loss of steelhead production in the East Fork Russian River upstream of Coyote Valley Dam.

Since the 1999/2000 season, an interim operations plan led to the cessation of hatchery production of coho salmon and Chinook salmon in the Russian River basin. Steelhead production goals, however, remained unchanged from the original mitigation plans. In 2001, a pilot program was implemented to analyze the effectiveness of a captive broodstock program for coho salmon. The coho salmon program is authorized through June 2007 to allow time for adequate implementation and analysis of the enhancement response (NMFS 2001a).

Under the proposed project, mitigation obligations of USACE for coho salmon, steelhead, and Chinook salmon would be formally revised to provide objectives that are realistic and feasible under current environmental and regulatory conditions.

The proposed project for coho salmon is a supplementation program to support recovery, which would include the current pilot captive broodstock program. This program is designed to conserve genetic resources of the Russian River coho salmon population, which is at risk of extirpation.

The steelhead isolated harvest program would provide opportunities for recreational fishing. The isolated harvest program has the potential to result in genetic effects to the remaining Russian River steelhead population. An integrated recovery program for steelhead (which would incorporate wild steelhead into hatchery broodstock to maintain genetic diversity and reduce domestication) would be evaluated for potential future implementation to reduce the risk of genetic effects to the naturally-spawning population.

Chinook salmon production is not proposed because short-term data suggest the naturally-spawning population appears large enough to sustain itself. If new information

indicates it is warranted, a supplementation program could be implemented for Chinook salmon.

Under the proposed project, fish production practices would be modified to minimize genetic and ecological effects to naturally spawning populations. Additional facilities would be constructed to provide a more reliable water supply to the hatchery and to support the coho salmon supplementation program.

POTENTIAL EFFECTS ON COHO SALMON, STEELHEAD, AND CHINOOK SALMON

In the Russian River system, the proposed project is likely to result in both positive and negative effects on listed salmonid species. The proposed project would reduce many of the potential negative effects under current baseline operations to a low or negligible risk level, remove the negative effect altogether, or provide a potential benefit to salmonids in the Russian River.

The potential effects of the proposed project on coho salmon, steelhead, and Chinook salmon are summarized below.

Coho Salmon

Coho salmon rear in Dry Creek and in tributaries to Dry Creek and the Lower Russian River. They have also been observed in tributaries in the Upper Russian River.

Project activities that would provide the greatest benefit to coho salmon in these reaches are the habitat restoration projects in priority coho salmon tributaries, and implementation of the Flow Proposal and the captive broodstock program. Instream habitat restoration would increase the quality of coho salmon habitat by providing more pools for rearing juveniles and improving fish passage to spawning grounds. The Flow Proposal would provide better rearing flows in Dry Creek during the summer and fall, which should improve juvenile survival rates. Finally, the broodstock program would increase the distribution of coho salmon by allowing managers to recolonize high-priority coho salmon streams with genetically appropriate stocks.

Project activities that would reduce the risk to coho salmon relative to baseline conditions are associated with operational modifications at the Mirabel and Wohler diversion facilities. Changes in project operations would improve conditions for migration by reducing the risk of impingement at both diversion facilities. Such changes would also provide escape for fish swept into the Wohler infiltration ponds during storm flows.

Several project components have the potential to continue to affect coho salmon. The Riverfront Park represents a low risk of entrapment because a few migrating juvenile or adult coho salmon may be entrapped in the lakes during high flows. Smaller risks of entrapment would occur at Spring Lake and the Mirabel and Wohler infiltration ponds. There is also the potential that juveniles could become stranded during inflation of the inflatable dam at Mirabel. Finally, sediment and vegetation maintenance in the constructed flood control channels on streams that support coho salmon (such as Santa Rosa Creek) may also negatively affect passage conditions during low flows.

For coho salmon, the benefits of the proposed project substantially outweigh the potential negative effects. The most substantial benefits would occur from the DCFH coho salmon supplementation program. The program proposes to raise coho salmon for release into the Russian River watershed to increase numbers and distribution of coho salmon. Additional benefits would result from habitat restoration efforts, and implementation of the Flow Proposal. Modifications to project facilities and operations reduce many existing risks to a low or negligible level. Cumulatively, the proposed project activities should help to halt declines in abundance of coho salmon in the Russian River and increase their distribution within the watershed.

Steelhead

Steelhead generally use the Upper and Middle Russian River mainstem and tributaries for spawning and rearing. Of the three species, steelhead are the most widespread in the basin and have the greatest potential to interact with project operations.

Project activities that would provide the greatest benefit to steelhead are the Flow Proposal, elimination of artificial breaching of the Estuary sandbar, habitat restoration projects in the Russian River, and modifications at the Mirabel and Wohler diversion facilities. Implementation of the Flow Proposal would improve juvenile rearing habitat in both the Russian River and Dry Creek by providing lower flows than under D1610. These lower flows would reduce the energetic expenditures required by juveniles to occupy their habitats, potentially resulting in better growth. Under the Flow Proposal, the sandbar in the Estuary would remain closed throughout the summer, which would improve rearing habitat in the Estuary. The instream restoration projects would help increase habitat complexity in the tributaries, which should increase the overall growth and survival rates of fry and juveniles in the watershed. Finally, structural and operational modifications at the Mirabel and Wohler diversion facilities would improve fish passage conditions over baseline, and would benefit steelhead rearing in the spring.

Several project components may continue to have a small negative effect on steelhead. Like coho salmon, a few migrating juveniles and/or adults could be entrapped during high flows in the Riverfront Park lakes, at Spring Lake, or in the Wohler and Mirabel infiltration ponds. There is also a small risk that rearing steelhead may become stranded during the inflation of the Mirabel dam. Finally, sediment and vegetation maintenance in the constructed flood control channels may affect some rearing habitat or impair passage in channels maintained for flood control purposes.

In general, implementation of the proposed project would significantly improve migration and rearing conditions for steelhead over baseline conditions and should help increase their abundance in the Russian River watershed.

Chinook Salmon

Primary Chinook salmon spawning and rearing occurs in the Russian River mainstem, selected larger tributaries such as Dry Creek, and the Estuary. Project components that affect the mainstem and Dry Creek overlap with Chinook salmon and their habitats. The

proposed project is likely to have only small, localized effects on Chinook salmon upstream migration, spawning, and incubation. The lifestages most likely to be affected are juvenile rearing and downstream migration.

As with steelhead, modifications at the Mirabel and Wohler diversion facilities would benefit juvenile downstream passage. Structural and operational modifications at Coyote Valley Dam would benefit Chinook salmon rearing. Elimination of summertime artificial breaching of the sandbar at the river mouth would substantially reduce the risk that early adult spawners would enter the river before conditions in the river are suitable.

Ongoing operations and maintenance activities are likely to continue to have some negative effects. The most substantial effects to rearing habitat would occur from localized habitat alterations due to gravel-bar grading and vegetation removal in the mainstem Russian River. Localized effects could also occur to Chinook salmon from inflation of the dam at Mirabel, and potential entrapment in the Riverfront Park lakes.

With the proposed project, potential negative effects on Chinook salmon would be substantially reduced from baseline conditions. The benefits of the proposed project would outweigh any localized negative effects and should help recover Chinook salmon populations throughout the Russian River watershed.

Overall Project

On balance, the proposed project would benefit coho salmon, steelhead, and Chinook salmon populations in the Russian River, improve the quantity and quality of habitat, and reduce exposure to harmful activities. The improved conditions would benefit multiple lifestages, in both tributary and mainstem habitat. Some adverse effects associated with the project are unavoidable. Therefore, the proposed project may continue to adversely affect some salmonids or impair habitat in small, localized areas such as sediment management in constructed flood control channels. Some project activities may be essential to recovery, like the coho salmon captive broodstock program and stream restoration or barrier removal projects. Other project activities, like the recycled water program, will depend on the willingness of agricultural users to use recycled water in place of surface water from tributary streams. The proposed project provides balance between activities that would provide essential services like water supply and flood control and potential adverse effects to listed salmonids and to the ecosystem on which they depend. Overall, the proposed project would improve conditions for all three of the listed salmonids.